BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554

In the Matter of	)	
	)	
Interference Rejection Thresholds	)	
Of Consumer Digital Television	)	**ET Docket No. 04-186**
Receivers available in 2005 and 2006	)	
	)	
Unlicensed Operation in the TV	)	
Broadcast Bands	)	

COMMENTS OF
SHURE INCORPORATED

Shure Incorporated ("Shwe"), by its undersigned counsel, hereby respectfully submits these brief Comments to the Commission's recently released Measurement Report of DTV Receiver Interference Rejection Capabilities ("DTV Receiver Report").'

As a leading manufacturer of wireless microphones and high-quality professional audio equipment authorized under Part 74 of the Commission's Rules to operate on unassigned television band frequencies, Shure is vitally interested in the Commission's assessment of the interference impact that new TV band devices will have on incumbent services including television **and** wireless microphones.' The Commission's evaluation of the interference rejection capabilities of DTV receivers is a fundamental component of the overall analysis of the impact of introducing new unlicensed devices into the TV bands as proposed in this proceeding.'

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[1] Interference Rejection Thresholds of Consumer Digital Television Receivers Available in 2005 and 2006, OET Report FCC/OET 07-TR-1003, released March 30,2007.

[2] Wireless microphones" as used herein includes a variety of audio devices authorized under Part 74 of the Commission's Rules as secondary users of locally unoccupied televisions channels. In addition to wireless microphones, this equipment includes in-ear monitors, wireless intercoms, wireless assist video devices ("WAVDs") and wireless cueing ("IFB") systems.

[3] For convenience, throughout this document, Shure refers to the new devices proposed to operate in the TV bands as "unlicensed" devices even though the Commission has not yet determined whether such devices should be licensed or unlicensed.

At the outset, Shure applauds the Commission's efforts to develop hard data for use in analyzing the interference risks to DTV receivers and other devices. The Commission's DTV receiver testing represents a first step in this evaluation process and the Commission's report reveals several important initial conclusions that bear on the continued consideration of allowing new unlicensed devices to operate in the unassigned TV channels:[4]

- DTV receivers -- not only wireless microphones -- are extremely vulnerable to harmful interference.

- Such interference has the potential to materially undermine acceptable performance of DTV receivers.

- Introduction of new unlicensed devices in the TV frequencies, especially mobile (personal/portable) devices, is potentially very problematic.

- The Commission's testing of interference protection measures proposed to protect TV, wireless microphones and other authorized services, in the TV frequencies will need to be broader in scope and more complex than the DTV receiver testing. The Commission should publish its planned test protocol and seek public input on the procedures prior to testing, as well as publish and accept public comment on its final report.

I. The Commission's Tests Reveal that DTV Receivers are Highly Susceptible to Interference

The Commission's interference tolerance test of eight **(8)** off-the-shelf DTV receivers demonstrated very significant vulnerability of these DTV receivers to interference. None of the DTV receivers satisfied the interference rejection capabilities recommended in the ATSC Receiver Guidelines and the tested receivers all proved highly susceptible to interference. In particular, the receivers were all prone to intermodulation interference from out-of-band emissions in nearby channels during tests involving multiple signals. Significantly, this testing showed that DTV receivers are vulnerable to intermodulation interference not just from adjacent

[4] These frequencies are commonly referred to as the "White Spaces." However, this reference is a misnomer that promotes the mistaken impression that this spectrum is currently vacant and therefore going to waste. As Shure and many others have discussed in prior filings, this spectrum is not vacant and is currently used by Part 74 wireless microphones, medical devices, and numerous other devices.

channels but also from transmissions on channels further removed from the desired channel. The DTV Receiver Report observes that the TVs are "at their most vulnerable" when operating at low desired signal levels and are as susceptible to interference from second adjacent channels as from first adjacent channels. Further, in certain instances, the TVs were susceptible to interference from even more remote channels (e.g., N+7).[5]

It is important to note exactly what the Commission's tests revealed -- and what they did not reveal -- with respect to interference caused by operations on adjacent channels. The tests were not aimed at evaluating the extent to which DTV receivers experience interference from signals operating on adjacent TV channels. In fact, the Commission was particularly careful to ensure that any such out-of-band emissions from undesired interfering signals were sufficiently filtered so as to prevent leakage into the channel being used by the desired signal. As such, these tests did not, and were not intended to, measure what level of out-of-band emissions would be necessary to protect DTV receivers or other devices.[6] Shure encourages the Commission to evaluate the potential interference from out-of-band emissions in its planned testing of proposed interference protection measures of unlicensed TV band devices.[7]

The Commission's testing also revealed that the "cliff' effect that is symptomatic of digital transmissions was noticeably more abrupt than anticipated.[8] The difference in the level of interference needed to create a dramatic degradation in picture quality or total reception loss was

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[5] DTV Receiver Report at 15-4.

[6] While the Commission's DTV Receiver testing did not analyze potential interference from out-of-band emissions, the IEEE 802.22's studies and analyses have determined that operation on first adjacent channels to DTV signals is not feasible in part because "onerous filtering and other measures in the unlicensed devices, with unacceptable impacts on device size, cost, power consumption, etc." would be required to protect the DTV signal. Comments of IEEE 802.18 to Further Notice of Proposed Rulemaking, ET Docket No. 04-1**86,** pp. **8-9,** filed January 31,2007.

[7] ***See*** *infra* Section III discussing these testing procedures.

[8] DTV Receiver Report at 15-3.

quite small (in some cases with only an additional 0.1 dB increase above threshold of viability ("TOV")).[9]

Although the results revealed by the Commission's testing are troubling, the reality may in fact be worse. The Commission's test procedures did not account for the possibility that using a relatively high power unlicensed device in close proximity to a DTV receiver will likely cause interference by signals entering the DTV set through paths other than the tuner input. Although the Commission apparently performed all of its tests using signals conducted directly into the tuner, a nearby unlicensed TV band device can cause interference by radiating directly into the lightly shielded enclosure of a victim receiver or device. Interference also can be picked up by the AC line cord or by audio or video cables plugged into the back of a DTV set. Significantly, this type of interference could affect not only over-the-air reception but also signals from satellite or cable TV boxes and other ancillary devices used by consumers (*e.g.*, DVD players).

II. The Vulnerability of DTV Receivers Poses Risks for the DTV Transition and Warrants a Conservative Approach to the Introduction of New Unlicensed Devices in the TV Frequencies

The ramifications of these test results for the DTV transition are enormous. Harmful interference to digital transmissions is an "all or nothing" proposition, risking total picture loss in the presence of interference. If unlicensed devices are introduced into the TV frequencies without guaranteed effective interference protections, consumers will suffer. During the DTV transition, harmful interference to DTV reception will be particularly confounding to consumers who are likely to experience a perfect picture in some instances while at other times are inexplicably unable to get any reception at all because someone in their home or *someone in a neighbor's home or in the next adjoining apartment* has turned on a new unlicensed TV band devices that is interfering. Further, consumers may be confused by instances in which a tuner

[9] ***Id.***

completely "skips over" a channel due to interference. In that case, the consumer may not even be aware that he or she should be able to receive a particular channel.

Given that the DTV receivers proved quite vulnerable to interference, the Commission must proceed with extra caution as it considers the technical rules required to allow new fixed unlicensed devices operating on TV frequencies to be distributed by February 17,2009. Further, the Commission should decline the recent requests to move up that date and/or also permit personal/portable unlicensed devices operating on TV frequencies to be distributed by the February 17,2009 date.[10] Both DTV receivers and wireless microphones experiencing interference from unlicensed devices have at least one important attribute in common: they both require extremely reliable and effective interference protections to avoid devastating signal interruptions and degradation. There is little room for error when it comes to interference to DTV receivers or wireless microphones before the essential functionality of the equipment is completely undermined.[11] **As** Shure has detailed in other filings in this docket, interference to wireless microphones from new unlicensed devices will harm the production of news gathering, movies, theatre, live music, cultural, religious, political and educational events.

The results of the Commission's testing clearly lead to the conclusion that effective interference protections must be developed, tested and securely in place *before* unlicensed devices are allowed to be introduced into the TV frequencies. Specifically, these requirements

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[10] ***See*** Petition for Reconsideration of The New American Foundation and The Champaign Urbana Wireless Network, ET Docket 04-1***86,*** pp. 11-12, filed on December 18,2006 (Petitioners argue that sale and use of unlicensed devices should be authorized prior to February 17, 2009. "The Commission should ... reconsider its decision to delay deployment, and should instead authorize marketing of devices as soon as the Commission develops rules and certifies that devices comply."); Reply Comments of Dell, Inc., Google, Inc., The Hewlett-Packard Co., Intel Corp., Microsoft Corp., and Philips Electronics North America Corp. ET Docket No. 04-1***86,*** pp. 17-18, filed on March 2,2007 (urging Commission to authorize sale of personal/portable devices by February 17, 2009).

[11] Wireless microphone users require the highest sound quality from their microphones. Audio anomalies such as "clicks," "pops," static or fades are not tolerated and "dropouts" (a momentary loss of sound) caused by interference are completely unacceptable, Professional users of wireless microphones have an exacting standard for sound transmission quality; a typical requirement for television broadcast audio quality is over 100 dB of signal-to-noise ratio throughout the duration of the program.

need to be established before fixed unlicensed devices systems are allowed to operate on these frequencies and before the "explosion" of personal/portable devices predicted to proliferate in these bands occurs.[12] Said another way, the Commission should not permit the introduction of these devices if it cannot prescribe technical requirements that would provide this level of interference protection to incumbent authorized services in the presence of fixed or personal/portable devices.

III. The Commission Should Expand Its Testing Procedures In Order To Accurately Evaluate Proposed Interference Protection Measures

Shure applauds the Commission's decision to publish its DTV Receiver Report, and to solicit public comment and reply comment on the Report. The public response to the DTV Receiver Report can contribute to the understanding and analysis of the interference rejection capabilities of DTV Receivers. Shure urges the Commission to follow these procedures and to go further with respect to its planned testing of the unlicensed device platform submitted by The Dell Coalition.[13] That testing is intended to assess the ability of devices with spectrum sensing and other interference protection technologies to protect incumbent services, such as televisions and wireless microphones, operating on TV frequencies. As such, this testing will need to be substantially broader in scope and more complex than the DTV receiver tests. The unlicensed device testing will need to evaluate the protection of a variety of incumbent services and, at least

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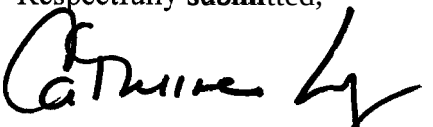
[12] ***See Ex Parte*** letter from Scott Blake Harris, Harris, Wiltshire & Grannis LLP, to Marlene H. Dortch, ET Docket 04-186, CS Docket 97-80 (Jan. 12,2007) ("Dell strongly supported using the television white spaces for personal and portable devices. They said there was a multi-billion dollar market, just waiting to explode ….").

[13] ***Ex Parte*** letter from Edmond J. Thomas, Harris, Wiltshire & Grannis LLP, to Marlene H. Dortch, ET Docket 04-186 (March 14,2007) (submitting the "Microsoft TV White Spaces Development Platform Version 1" to the FCC labs for testing). The Dell Coalition concedes that this testing device is not intended as a product for sale to consumers, but is a "development platform to explore, develop and evaluate technologies required *to create* a commercially viable cognitive, radio-based communications network product." *Id.* at 1 (emphasis added). While it is necessary and useful for the Commission to evaluate the "development platform" to gain some insight as to the potential to develop cognitive radio technologies in these frequencies, it falls short of a meaningful opportunity to evaluate a prototype device whose interference protection capabilities can be counted on to protect incumbent services from interference.

with respect to wireless microphones, a variety of use models (wireless microphones, by definition, are intended to be used while moving around). Further, the unlicensed device platform will possibly need to be tested in both fixed and personal/portable applications. Shure recommends that the Commission first publish and solicit public comment on its planned test protocol so that the Commission's testing will be designed from the beginning to be as useful as possible.

The implementation of the Commission's twin goals in this proceeding -- to permit new innovative devices to operate on unused TV frequencies without causing interference to existing users -- requires carefully crafted technical rules based on effective and comprehensive testing of the technologies being offered to provide that protection. Public notice and comment on the test procedures intended to be used as well as the final report and conclusions are necessary steps to developing meaningful technical requirements.

Respectfully submitted,



Catherine Wang
Bingham McCutchen LLP
2020 K Street, N.W.
Washington, DC 20006
(202) 373-6000

Counsel to Shure Incorporated

Ahren J. Hartman
Director, Platform Planning
Edgar C. Reihl, P.E.
Technology Director, Advanced Development
Shure Incorporated
5800 Touhy Avenue
Niles, IL 60714-4608

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